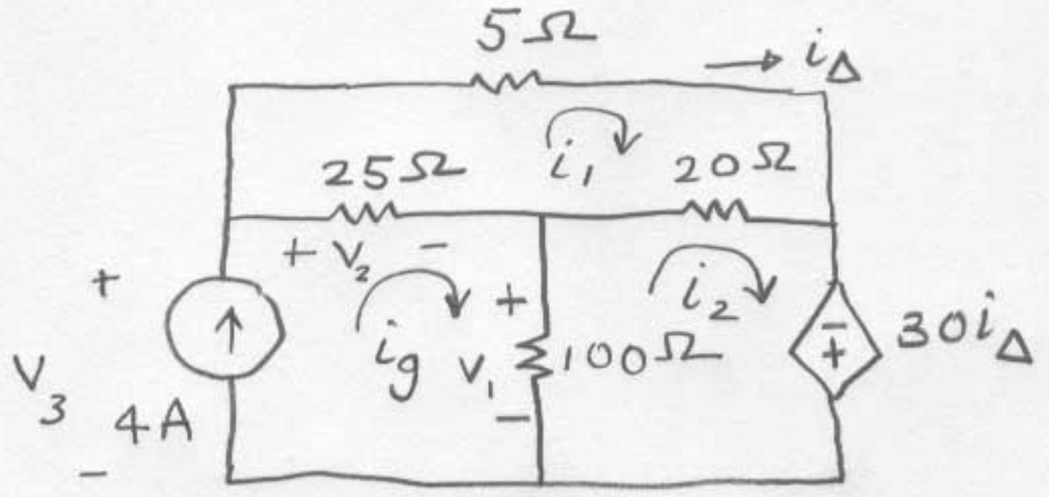
P 4.38



$i_g = 4$

$50i_1 - 20i_2 - 25i_g = 0$

$-20i_1 + 120i_2 - 30i_\Delta = 0$, $i_\Delta = i_1$

Solving , $i_1 = 4A$, $i_2 = 5A$

$i_{25\Omega} = 4 - i_1 = 0$, $i_{20\Omega} = i_2 - i_1 = 1A$, $i_{100\Omega} = 4 - i_2 = -1A$

$i_{5\Omega} = i_1 = 4A$, $V_1 = 100(i_g - i_2) = -100V$, $V_2 = 25(i_g - i_1) = 0$.

$\therefore V_3 = V_2 + V_1 = 0 + (-100) = -100V$

$\therefore P_{4A} = -4V_3 = 400W$ (abs)

$30i_\Delta = 30i_1 = 120V$ (voltage of dependent source).

$\therefore P_{30i_\Delta} = -(30i_\Delta)i_2 = -600W$ (dev.)

$P_{5\Omega} = 16(5) = 80W$, $P_{25\Omega} = 0$, $P_{20\Omega} = 1(20) = 20W$

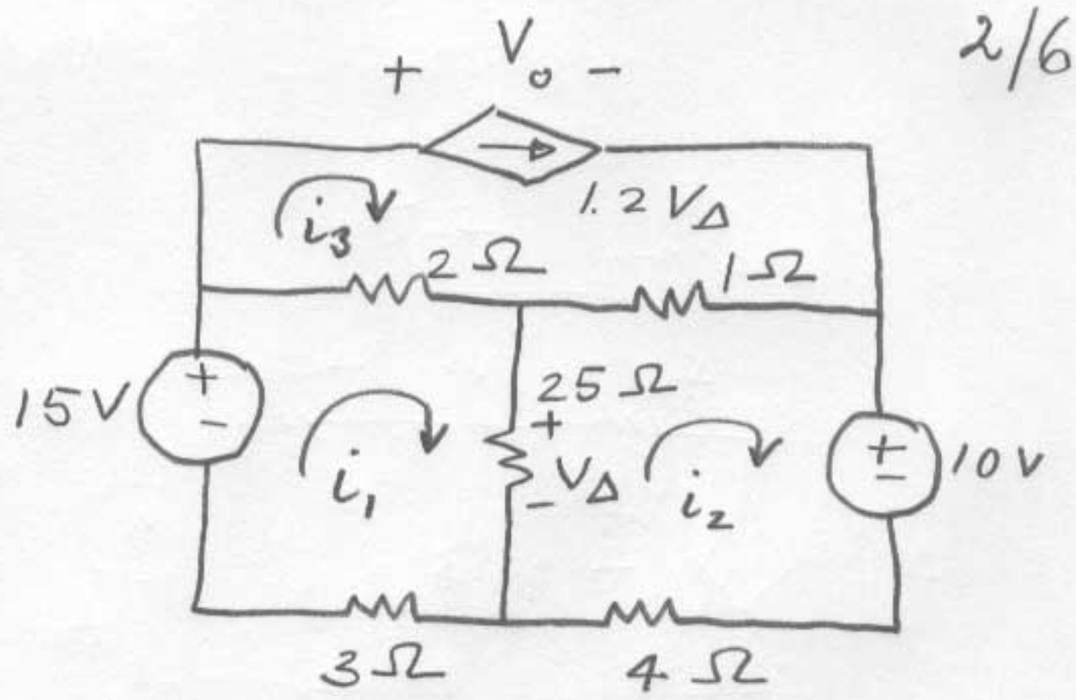
$P_{100\Omega} = 1(100) = 100W$.

$\therefore \sum P_{abs} = P_{4A} + P_{5\Omega} + P_{25\Omega} + P_{20\Omega} + P_{100\Omega}$

$= 400 + 80 + 0 + 20 + 100 = 600W$

$\therefore \sum P_{abs} = \sum P_{del.} = 600W$

P 4.42 a)



$$15 = 30i_1 - 25i_2 - 2i_3$$

$$-10 = -25i_1 + 30i_2 - i_3$$

$$i_3 = 1.2\,v_\Delta\,,\quad v_\Delta = 25(i_1 - i_3)$$

Solving, $i_1 = 10\,A$, $i_2 = 9\,A$, $i_3 = 30\,A$

$$i_{2\Omega} = i_1 - i_3 = 10 - 30 = -20\,A$$

$$P_{2\Omega} = (-20)^2(2) = 800\,W$$

b) $P_{15V} = -15(10) = -150\,W$ (dev.)

$P_{10V} = 10i_2 = 10(9) = 90\,W$ (abs.)

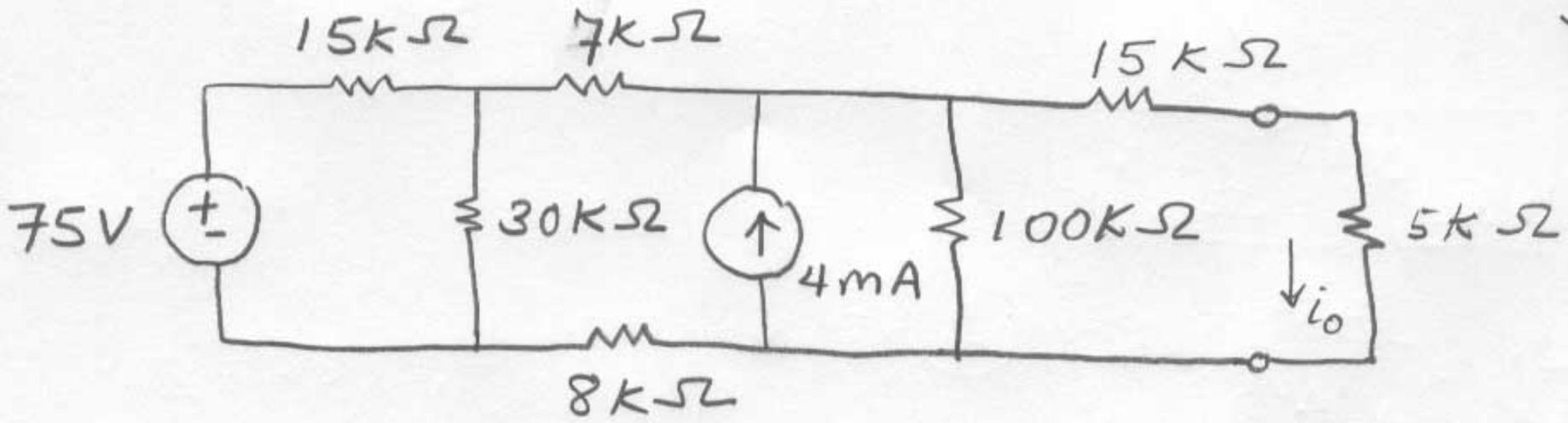
$v_o = 2(i_1 - i_3) + 1(i_2 - i_3) = -40 - 21 = -61\,V$

$P_{1.2v_\Delta} = i_3 v_o = 30(-61) = -1830\,W$ (dev.)

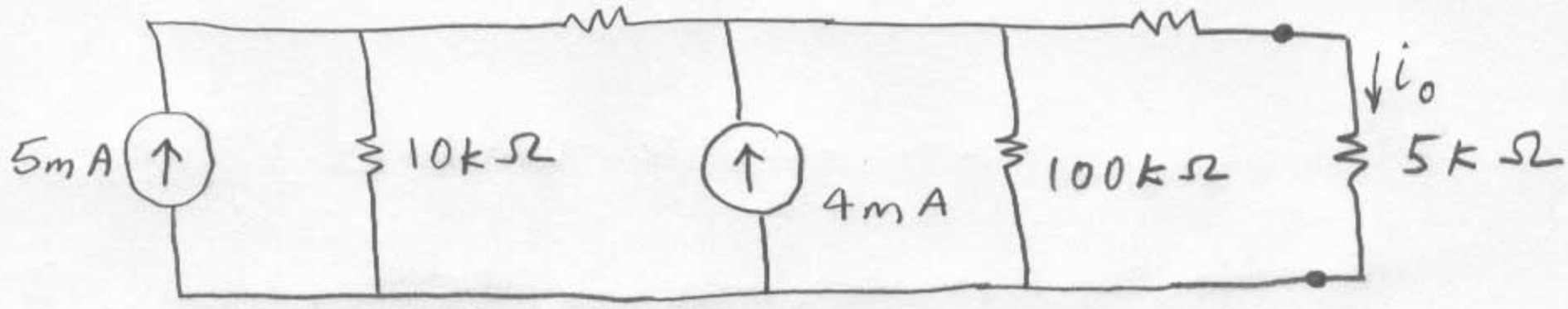
$\sum P_{dev.} = 1830 + 150 = 1980\,W$

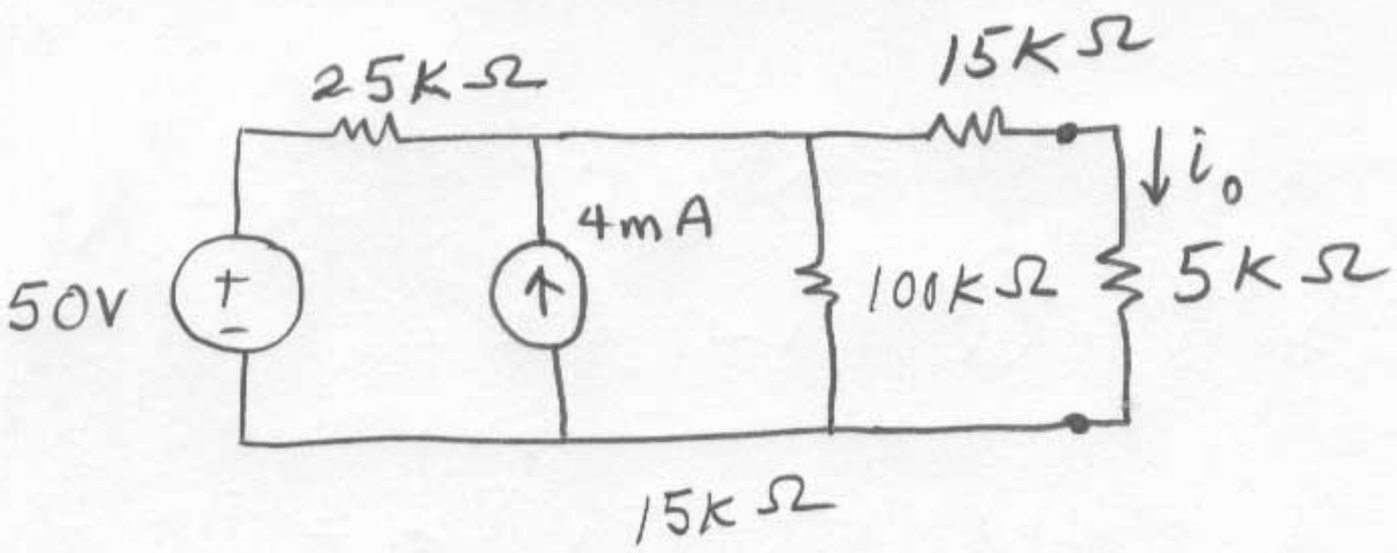
% delivered to $2\Omega = \frac{800}{1980} \times 100 = 40.4\%$

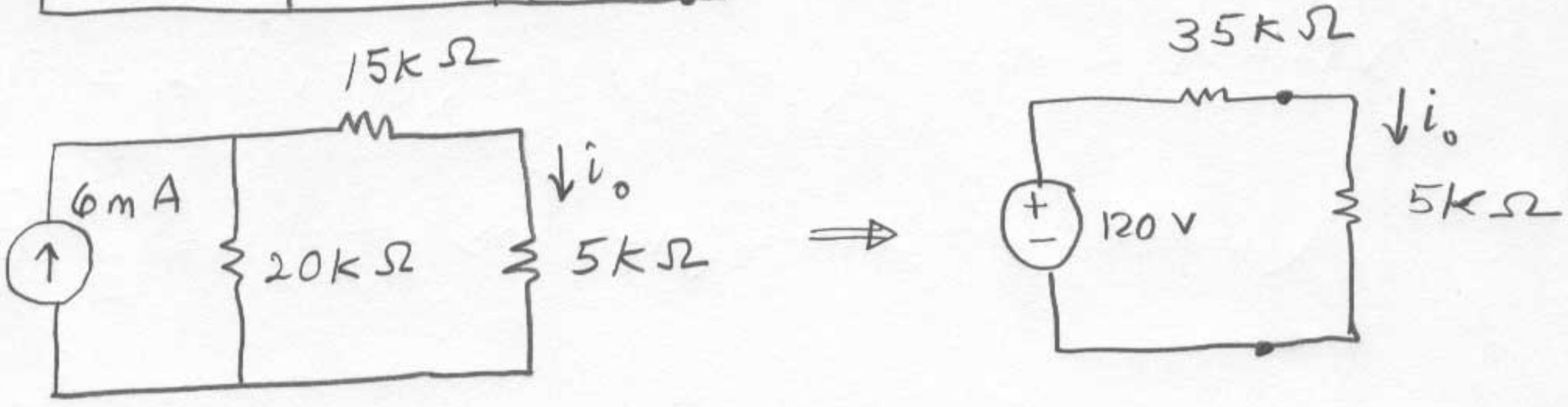
P 4.5 a)



7kΩ in series with 8kΩ $\Rightarrow$ 7+8 = 15kΩ.

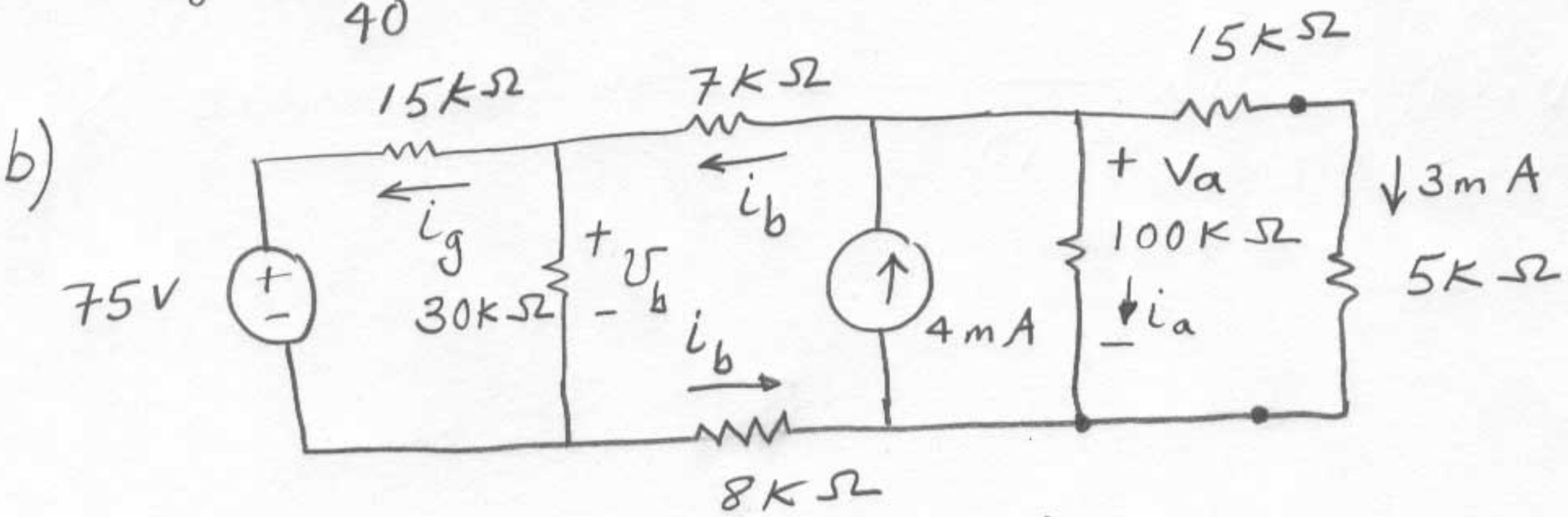






$$i_o = \frac{120}{40} = 3\,mA.$$

b)



$v_a = 3(20) = 60V$, $i_a = \frac{v_a}{100} = 0.6\,mA$

$i_4 = 4 - 3.6 = 0.4\,mA$

$v_b = 60 - 0.4(15) = 54\,V$

$i_g = 0.4 - 54/30 = -1.4\,mA$

$P_{75V} = 75(-1.4) = -105\,mW\ (dev.)$

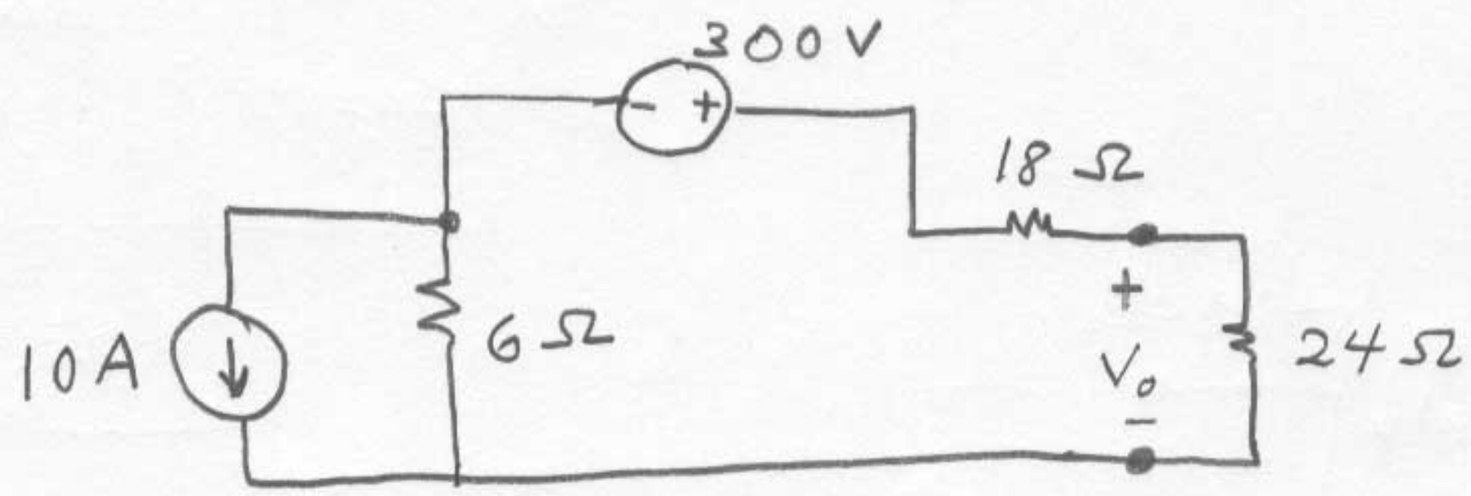
Check: $P_{4mA} = -60(4) = -240\,mW\ (dev.)$

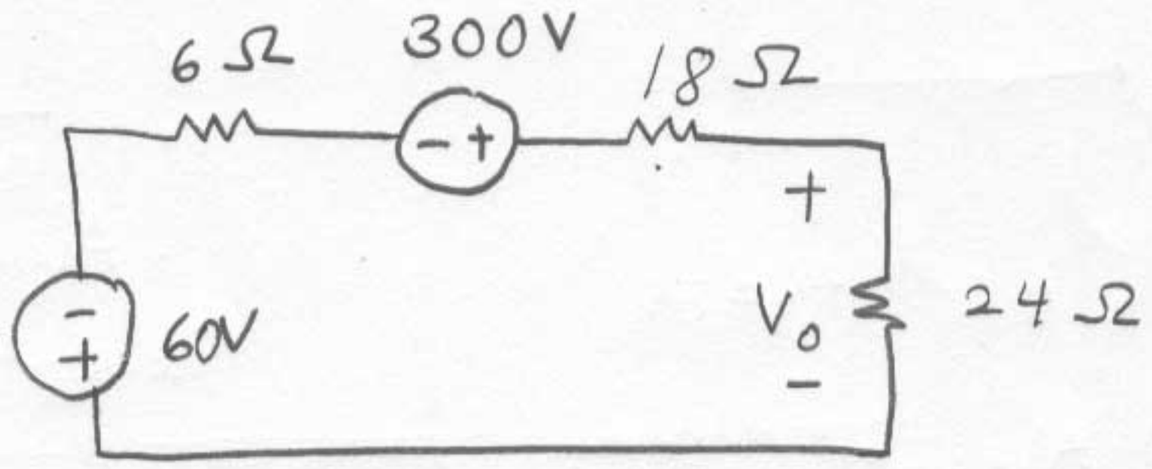
$\sum P_{dev.} = 105 + 240 = 345\,mW$

$\sum P_{dis} = (-1.4)^2(15) + (1.8)^2(30) + (0.4)^2(15)$

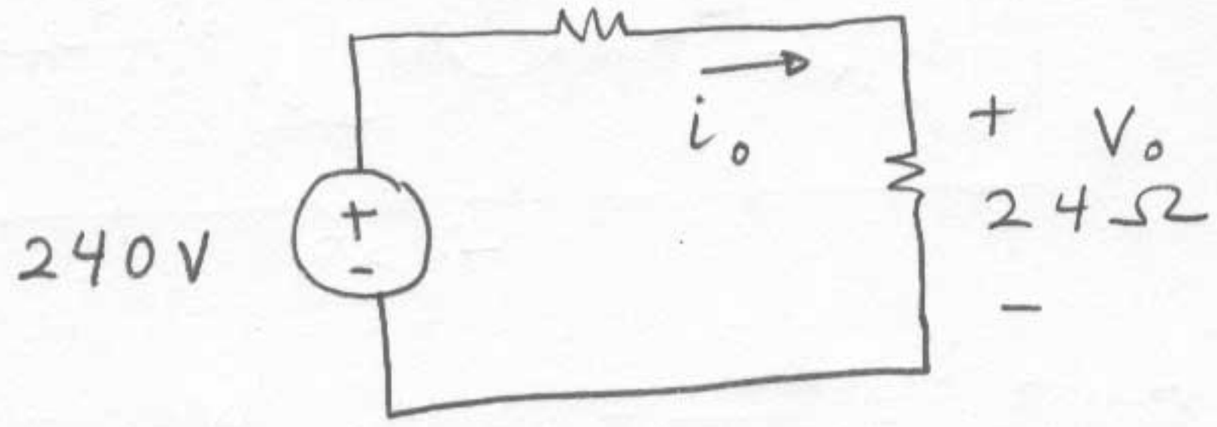
$+ (0.6)^2(100) + (3)^2(20) = 345\,mW$

P 4.53 a)



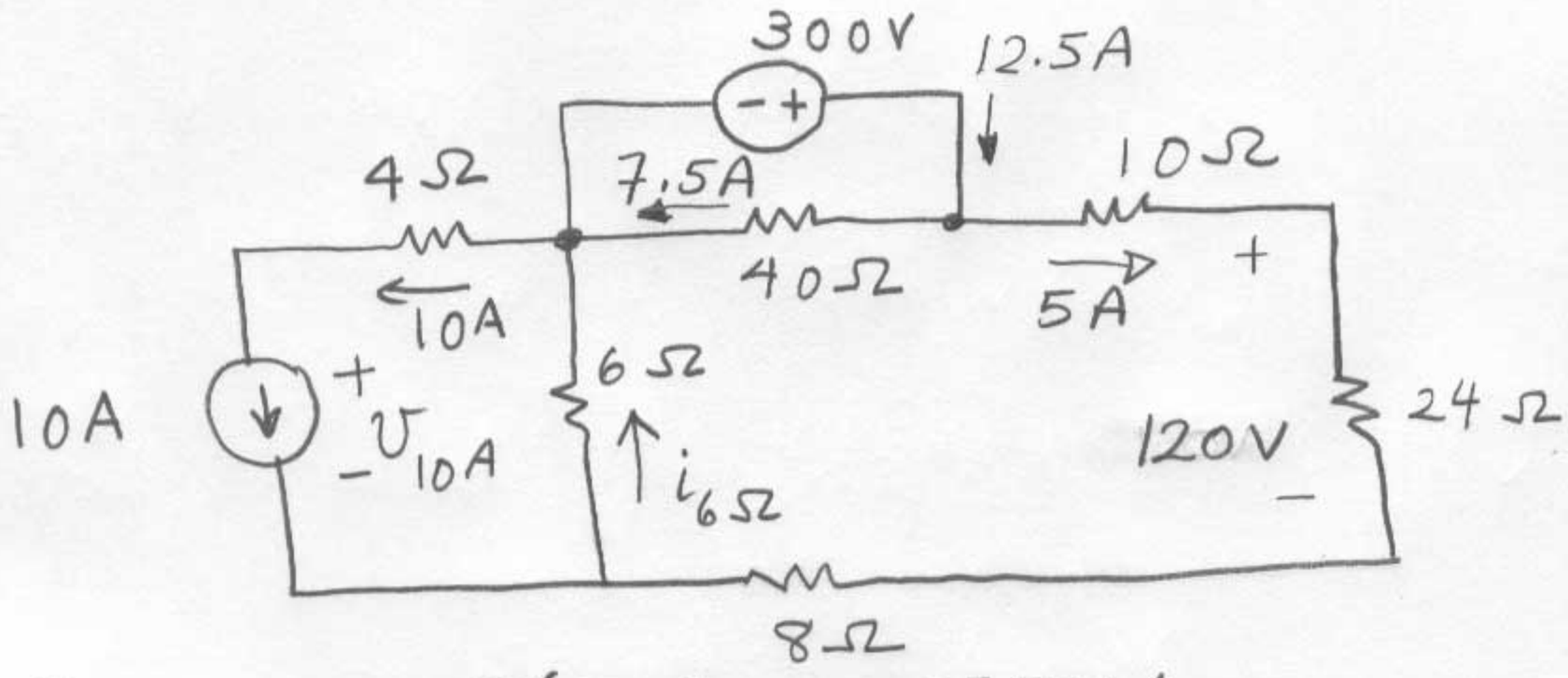


24 Ω



$\therefore V_o = \frac{1}{2}(240) = 120\ V, \quad i_o = \frac{120}{24} = 5A$

b)



$$P_{300V} = -12.5(300) = -3750\,W$$

∴ The 300V source develops 3750W.

c) $-10 + i_{6\Omega} + 7.5 - 12.5 = 0$, $\therefore i_{6\Omega} = 15A$

$$v_{10A} + 4(10) + 6(15) = 0 \quad , \therefore v_{10A} = -130V$$

$$P_{10A} = 10\,v_{10A} = -1300\,W$$

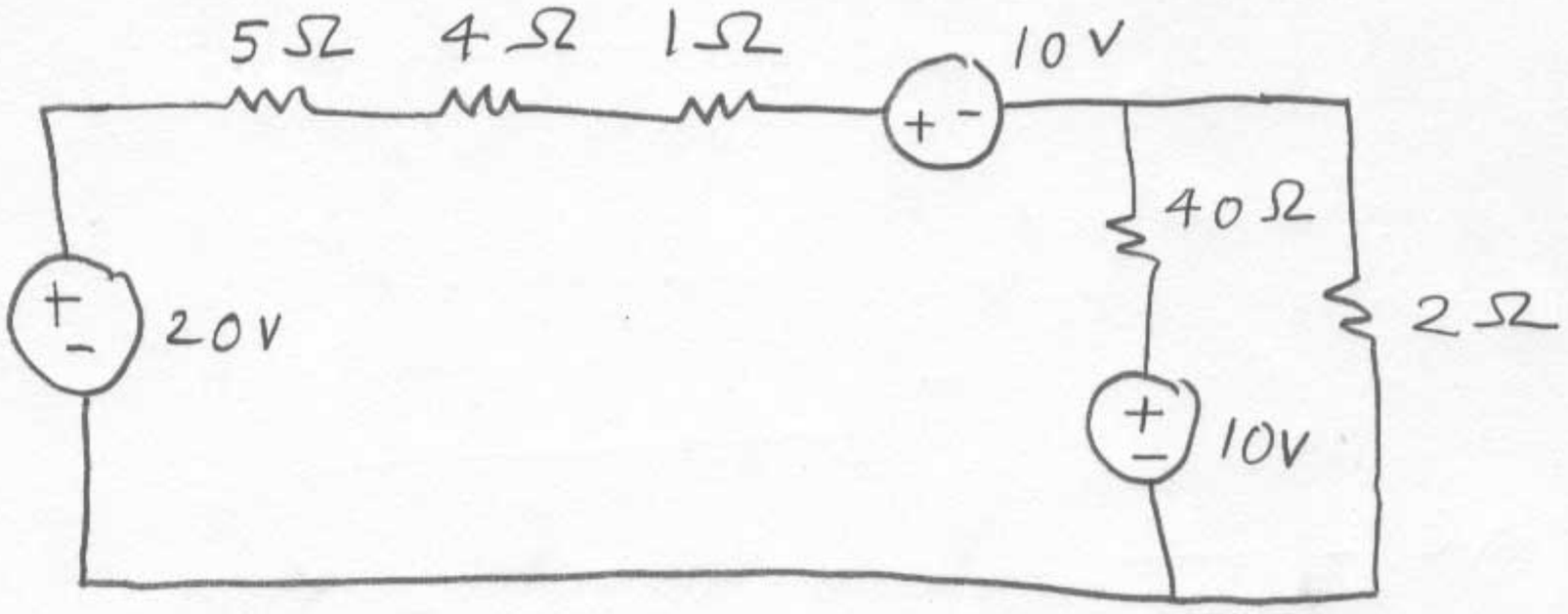
∴ The 10A source develops 1300W.

d) $\sum P_{del} = 3750 + 1300 = 5050\,W$

$$\sum P_{dis} = 100(4) + (7.5)^2(40) + (15)^2(6) + (5)^2(42)$$

$$= 5050\,W$$

P 4.54 a)



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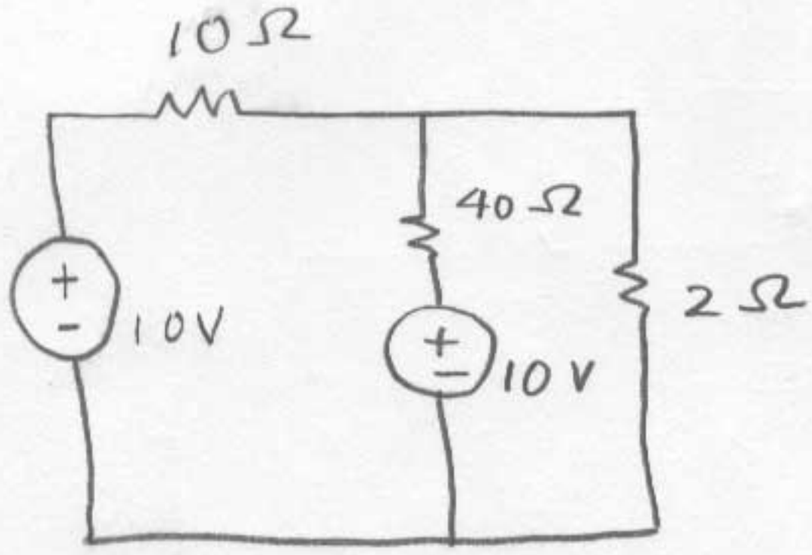
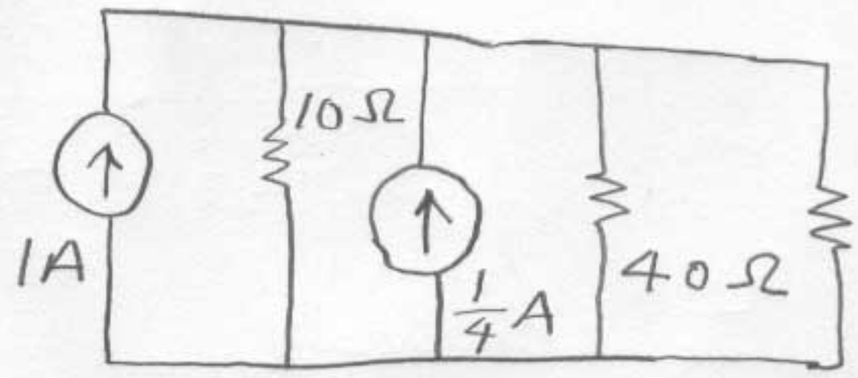
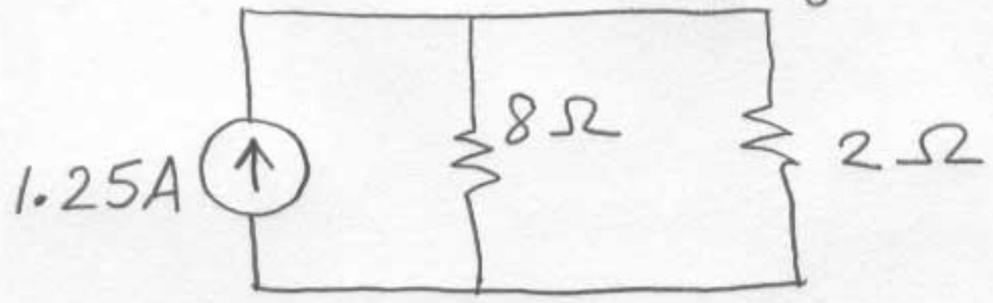
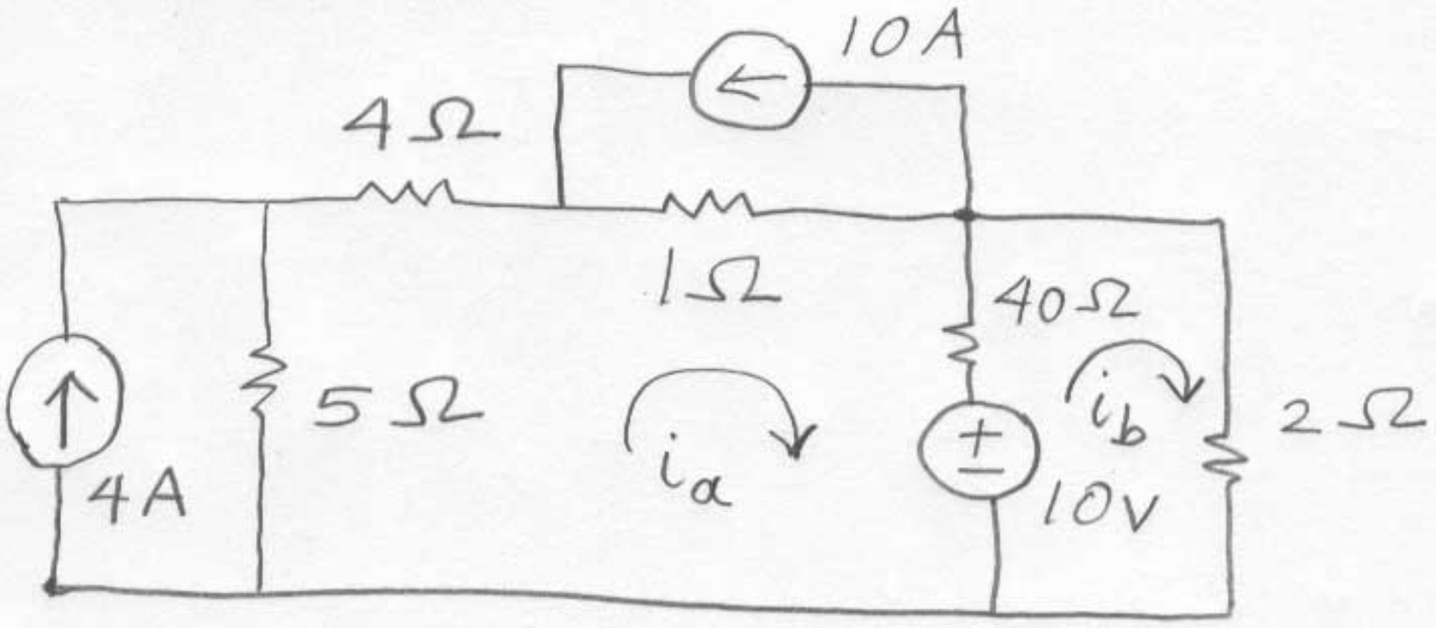






$$\therefore i_o = \frac{1.25(8)}{10} = 1A$$

b)



$$50i_a - 40i_b = 20 - 10 - 10 = 0 \quad \text{(from mesh a)}$$

$$-40i_a + 42i_b = 10 \quad \text{(from mesh b)}$$

$$\therefore i_b = 1A = i_o$$